

We claim:

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1. A method of generating an intermediate representation of program code, the method comprising the computer implemented steps of:

10 generating a plurality of register objects representing abstract registers, a single register object representing a respective abstract register; and

generating expression objects each representing a  
15 different element of said program code as that element arises in the program code, each expression object being referenced by a register object to which it relates either directly, or indirectly via references from other expression objects.

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2. A method according to claim 1, wherein said program code is expressed in terms of an instruction set of a subject processor.

25 3. A method according to claim 2, wherein said register objects represent abstract registers corresponding to registers of said subject processor.

4. A method according to claim 1, wherein each of  
30 said steps are performed sequentially for basic blocks of said program code having only one effective entry point instruction and one effective exit point instruction.

5. A method according to claim 1, wherein at least some said expression objects feed into more than one said register object.

5 6. A method according to claim 1, wherein said expression objects are not duplicated.

7. A method according to claim 1, wherein a single said expression object is generated for a given element of  
10 said program code, and each said expression object is referenced by all said register objects to which it relates.

8. A method according to claim 1, wherein if a said  
15 register object or a said expression object becomes redundant or unnecessary it is eliminated.

9. A method according to claim 8, wherein a redundant  
or unnecessary said register object or said expression  
20 object is identified by maintaining an ongoing count of references being made to that object as a network of register and expression objects is constructed.

10. The method according to claim 9, wherein for each  
25 expression object a count is maintained of the number of references to that expression object from other expression objects or from register objects, the count associated with a particular expression object being adjusted each time a reference to that expression object is made or  
30 removed.

11. A method according to claim 10, wherein an expression object and all references from that expression

object are eliminated when said count for that expression object is zero.

12. The method of claim 1, comprising translating the  
5 program code written for execution by a processor of a first type so that the program code may be executed by a processor of a second type, using the generated intermediate representation.

10 13. The method of claim 12, wherein said translating step is performed dynamically as the program code is run.

14. The method of claim 1, comprising optimising the  
15 program code by optimising the generated intermediate representation.

15. The method of claim 14, wherein said optimising  
step is used to optimise the program code written for  
20 execution by a processor of a first type so that the program code may be executed more efficiently by that processor.

16. A method for generating an intermediate  
representation of program code written for running on a  
25 programmable machine, said method comprising:

(i) generating a plurality of register objects for  
holding variable values to be generated by the program  
code; and

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(ii) generating a plurality of expression objects  
representing fixed values and/or relationships between

said fixed values and said variable values according to said program code;

5       said objects being organised into a branched tree-like network having all register objects at the lowest basic root or tree-trunk level of the network with no register object feeding into any other register object.

10       17.       A system for generating an intermediate representation of program code, comprising:

15               means for generating a plurality of register objects representing abstract registers, a single register object representing a respective abstract register; and

20               means for generating expression objects each representing a different element of said program code as that element arises in the program code, each expression object being referenced by a register object to which it relates either directly, or indirectly via references from other expression objects.

25       18.       A system for generating an intermediate representation of program code written for running on a programmable machine, the system comprising:

30               means for generating a plurality of register objects for holding variable values to be generated by the program code; and

              means for generating a plurality of expression objects representing fixed values and/or relationships between

said fixed values and said variable values according to  
said program code;

wherein said objects are organised into a branched  
5 tree-like network having all register objects at the  
lowest basic root or tree-trunk level of the network with  
no register object feeding into any other register object.

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11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 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